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Design Construction Analysis Feedback

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CEMP-EC

Subject: Testing Requirements for Plumbing Systems

Applicability: Information

Feedback from Design Construction Evaluations (DCE's) indicate plumbing systems are not being fully tested as required by contract specification 15400, General Purpose Plumbing. The contract specifications require the plumbing system to be tested in accordance with the National Standard Plumbing Code. The Code states, "New, altered, extended or replaced plumbing shall be left uncovered and unconcealed until it has been tested and approved. Where such work has been covered or concealed before it is tested and approved, it shall be exposed for testing." A copy of the following tests, from the Code, is provided to help ensure that testing is completed on the drainage, vent, building sewer and water supply systems. The following information is provided only for reference. It is the responsibility of each field office to obtain a copy of the edition of the National Standard Plumbing Code referenced in the contract specifications. The code references listed below are from the 1996 edition of the National Standard Plumbing Code and need to be compared against the edition of the Code referenced in your contract. In addition, compliance with requirements specified in addition to code references must be met in order to determine that contract provisions have been satisfied.

1. **Methods of Testing The Drainage and Vent Systems**:

Rough plumbing drainage and venting systems shall be tested upon completion of the rough piping installation. The Code allows either water or air pressure to prove the system is water tight. Per the Code one of the following test methods shall be used for the rough plumbing test.

a. "The water test shall be applied to the drainage system either in its entirety or in sections after rough piping has been installed. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system filled with water to point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest opening of the section under test, and each section shall be filled with water, but no section shall be tested with less than a 10-foot head of water. In testing successive sections at least the upper 10 feet of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 feet of the system) shall have been submitted to a test of less than 10-foot head of water. The water shall be kept in the system or in the portion under test for at least 15 minutes before inspection starts; the system shall then be tight at all points."

b. "The air test shall be made by attaching an air compressor testing apparatus to any suitable opening and after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of 5 pounds per square inch or sufficient to balance a column of mercury 10 inches in height. The pressure shall be held without introduction of additional air for a period of at least 15 minutes."

A finished plumbing test shall be performed per Code, "After the plumbing fixtures have been set and their traps filled with water their connections shall be tested and proved gas and water tight. The following test method shall be employed:

a. The final test for gas and water tightness of the completed drainage and vent system shall be made by a smoke test, or other method acceptable to the Administrative Authority. A smoke test shall be made by filling all traps with water and then reintroducing into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, they shall be closed and a pressure equivalent to a one-inch water column shall be developed and maintained for the period of the inspection.

b. Where the Administrative Authority, due to practical difficulties or hardships, finds that a smoke test cannot be performed, a peppermint test shall be substituted in lieu thereof. Such peppermint test shall be conducted by the introduction of two ounces of oil of peppermint into the roof terminal of every line or stack to be tested. The oil of peppermint shall be followed at once by ten quarts of hot (140 degrees F) water whereupon all roof vent terminals shall be sealed. A positive test, which reveals leakage, shall be the detection of the odor of peppermint at any trap or other point on the system. Oil of peppermint or persons whose person or clothes have come in contact with oil of peppermint shall be excluded from the test area."

2. **Methods of Testing Building Sewer**:

Per the Code, "The building sewer shall be tested by insertion of a test plug at the point of connection with the public sewer, private sewer, individual sewer disposal, or other point of disposal. It shall then be filled with water under a head of not less than 10 feet. The water level at the top of the test head of water shall not drop for at least 15 minutes. Where the final connection of the building sewer cannot reasonably be subjected to a hydrostatic test, it shall be visually inspected."

3. **Methods of Testing Water Supply Systems**:

The water supply system shall be tested as stated in the Code, "Upon completion of a section or the entire water supply system, it shall be tested and proved tight under a water pressure not less than the working pressure under which it is to be used or 80 pounds per square inch, whichever is greater.

a. For metallic pipe and where the Administrative Authority determines that providing potable water for the test represents a hardship or practical difficulty, the system may be tested with air to the pressures noted above, as allowed by pipe manufacturer.

b. For plastic pipe, testing by compressed gas or air pressure shall be prohibited.

c. Piping shall be disinfected after testing."

4. In addition to the tests required by Code contract specifications require the following additional tests, flushing and disinfection.

a. Test all Backflow Prevention Assemblies using gauges specifically designed for the testing of backflow prevention assemblies. Test reports for each assembly shall be provided to the Contracting Officer's Representative.

b. Shower pans shall be flooded with water to minimum depth of 1 inch for a period of 24 hours.

c. Compressed air piping shall be filled with oil-free dry air or gaseous nitrogen to 150 PSIG and held for 2 hours with no drop in pressure.

d. Operational test of plumbing system to demonstrate satisfactory functional and operational efficiency.

e. Flush potable water system, after pressure test, producing a minimum water velocity of 2.5 feet per minute.

f. Disinfection of the entire domestic hot and cold water distribution system. Water chlorination procedure shall be in accordance with American Water Works Association (AWWA) M20. The chlorinating material shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). Chlorine application shall continue until the entire main is filled. The water shall remain in the system for a minimum of 24 hours. Following the 24-hour period, no less than 25 ppm chlorine residual shall remain in the system. The system shall then be flushed with clean water until the residual chlorine is reduced to less than one part per million. During the flushing period each valve and faucet shall be opened and closed several times. From several points in the system the Contracting Officer will take samples of water in properly sterilized container for bacterial examination. The samples of water shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA. The testing method used shall be either the multiple-tube fermentation

technique or the membrane-filter technique. The sterilizing shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

All tests shall be documented and turned over to the user with the O&M manuals. This DCAF Bulletin has been fully coordinated with CEMP-ET. My point of contact is the Construction and Design Branch (CEMP-EC) at (202) 761-0205.

KISUK CHEUNG, P.E.
Chief, Engineering and Construction Division